Insights into how a stroke affects reading could help with rehabilitation

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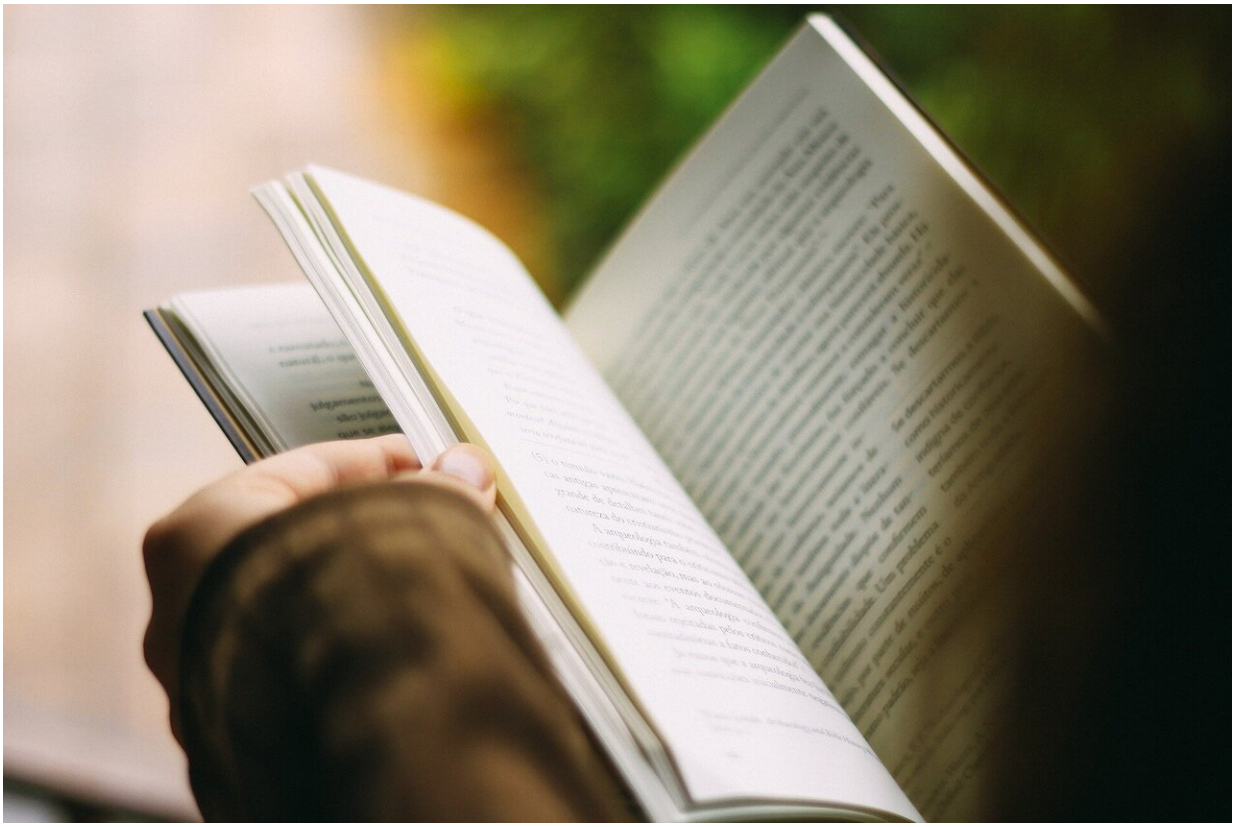

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Georgetown University researchers, looking at the ability of people to sound out words after a stroke, found that knowing which region of the brain was impacted by the stroke could have important implications for

helping target rehabilitation efforts.

The finding appeared August 30, 2021, in *Brain Communications*.

"One in five stroke survivors in the United States live with persistent language impairment. Most of these people also struggle with reading," says the study's first author, J. Vivian Dickens, Ph.D., a Georgetown University MD/Ph.D. student conducting research in the university's Cognitive Recovery Lab and Center for Aphasia Research and Rehabilitation at Georgetown's Medical Center. "Our study clarifies the neuroanatomical and cognitive bases of post-stroke reading and language deficits, which could help facilitate predictions of deficits in stroke survivors and suggest targeted treatments."

The research focus was on phonological processing, which is understanding and being able to use the sounds that comprise language. There are three principal aspects to this processing: *auditory*, or the ability to recognize the sounds of words, such as judging if words rhyme; *motor*, which is the ability to produce accurate and clear speech; and *auditory-motor translation*, which is the translation of sounds heard into speech.

"The goal of this study was to understand how post-stroke difficulties with the three different aspects of phonology relate to difficulties with reading," says Dickens. "There are two broad ways that people read words: one involves sounding out words, which is particularly important for reading new words; the other involves whole-word recognition. People with post-stroke language impairment frequently have specific trouble sounding out words."

The investigators tested reading and phonological abilities in 67 people, 30 of whom had had a stroke and 37 that had not. Advanced MRI techniques allowed the researchers to trace out white matter connections,

which are akin to wiring diagrams for the brain, as well as map out stroke locations in the brains of affected study participants.

"We found two different patterns of reading problems. Strokes involving the left frontal lobe caused problems with motor phonology and one of the two ways of reading, specifically sounding out words. In contrast, strokes involving the left temporal and parietal lobes caused problems with auditory-motor translation and *both* ways of reading," says Dickens. "These results may help clinicians develop therapies focused on specific reading problems that individual stroke survivors often struggle with."

"This study focused on reading aloud single words, a classic measure of reading ability," says Peter E. Turkeltaub, MD, Ph.D., director of the Cognitive Recovery Lab in the Center for Brain Plasticity and Recovery, medical director in the Center for Aphasia Research and Rehabilitation and senior author of the article. "Our results are an important step forward in revealing the mechanisms of translating print to sound, which is crucial for developing rehabilitative therapies for patients who have had strokes."

The investigators are planning studies to help confirm the extent to which these findings can be generalized to silent reading, which relies on the same core psychological processes as oral reading and is more important for reading in daily life. The researchers are also hoping to turn their research tasks into useful clinical tests to diagnose phonological processing.

In addition to Dickens and Turkeltaub, authors of the manuscript at Georgetown include Andrew T. DeMarco, Candace M. van der Stelt, Sarah F. Snider, Elizabeth H. Lacey and Rhonda B. Friedman. John D. Medaglia is affiliated with Drexel University and the University of Pennsylvania, both in Philadelphia.

The authors report no competing interests.

More information: J Vivian Dickens et al, Two types of phonological reading impairment in stroke aphasia, *Brain Communications* (2021). DOI: 10.1093/braincomms/fcab194